

# AMATEUR SATELLITE REPORT

*AMSAT's Newsletter for the Amateur Space Program.*



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(See last page for details)

## **AMSAT At Dayton Hamvention: Vintage '84**

Taking full advantage of the showcase offered by the largest amateur radio assemblage in the world, AMSAT plans a full agenda of seminars at this year's Dayton Hamvention, April 27, 28 and 29. Visitors to the show will be treated to a diverse program of satellite-related topics by an equally diverse group of AMSAT experts.

As we went to press these were the exciting events on tap for the weekend.

Early attendees will catch the Friday forum featuring AMSAT General Manager Bill Lazzaro, N2CF. Bill will explain AMSAT, Its Purpose and Operation. He will be followed by Executive Vice President Vern "Rip" Riportella, WA2LQQ who will present a review of today's satellites and a preview of tomorrow's. Bill Tynan, W3XO, who represented AMSAT in the W5LFL Ham-In-Space Project, will review that activity and forecast future similar events which may be just around the corner. Net Manager Wray Dudley, W8GQW, will moderate the Friday forum and also explain the nature and purpose of AMSAT's on-the-air network and information program.

Those who can resist the legendary Dayton fleamarket Saturday will be treated to yet a second panel of experts on a panel moderated by Senior Vice President John Champana, K8OCL. Panelists will include President Tom Clark, W3IWI; Vice President (Engineering) Jan King, W3GEY; Assistant Vice President (Engineering) Harold Price, NK6K and special guest speaker Hans Groenendaal, ZS6AKV who was recently elected President of AMSAT South Africa. Topics will include OSCAR 10 design, operation and beginner station equipment; packet radio and satellites and the AMSAT-Stoner Challenge Cup AO-10 competition.

On Sunday, the Hamvention wrapup day, *Orbit* Magazine Editor Harold Winard, KB2M, will moderate a panel which will discuss AMSAT in the future. Panelists will include W3IWI, K8OCL, W3GEY and WA2LQQ. Also discussed will be advanced projects including Solar Sail of the World Space Foundation, Amateur Space Telescope of the Independent Space Research Group and others.

In addition to the exciting forums and panels, AMSAT will have a busy booth stocked with the goodies long-associated with this event. The "Future Now" T-Shirts will reprieve, belt buckles, AMSAT Software Exchange products will be

available. Featured too will be the new ARRL/Davidoff Satellite Experimenter's Handbook. AMSAT's T-shirt cover girl, Amy is expected to make a cameo appearance over the weekend. Don't miss the chance to have your own AMSAT T-Shirt initialed by this famous young fawn.

## **AMSAT-Stoner Challenge Begins**

The first-ever OSCAR 10 satellite competition got under way 15 April on the heels of a welcomed announcement by the Northern California DX Foundation that it would sponsor the awards. AMSAT eliminated the entry fee in response to this support according to Operations Vice President Doug Loughmiller, KO5I.

At press time hundreds of contacts had been racked up by competitors in the 90 day event. Stations world-wide are participating and enthusiasm is reported high.

Meanwhile, Don Stoner, W6TNS, has contacted AMSAT and suggested an interest in participating in the awards ceremony next autumn. It was Stoner who in April 1959 set in motion a chain of events which led first to OSCAR 1 and ultimately to OSCAR 10. (See *Orbit* #17 and *QST* for April 1984, page 57, for stories by KO5I on how it all began!)

In a related development, N4DZD has suggested to AMSAT that a small committee of observers be established to oversee the competition. Bill's suggestion involves citing those who best exemplify the gentlemen's approach to satellite competition. Awardees here, Bill says, would not be those with the highest grid square total but rather the most courteous observed by committee members. AMSAT was known to be studying the concept at press time and an announcement may be made at the Dayton Hamvention regarding a "courtesy" type award.

Complete rules for the AMSAT-Stoner 25th Anniversary Challenge Cup are found in ASR #71 with clarification of minor points in #73.

## **UO-11 Silence Persists; Salvation Prospects Sag**

The so-called watchdog timer which formed the central hope for a prompt extrication from a post-launch glitch has turned out to be a toothless mutt. After the 2-meter beacon



went silent within hours of launch it was thought an instability in the power regulator to the 2-meter beacon had caused the beacon to generate noise. The noise, ASR was told, was blocking further commanding of the bird. However, hope focused on the watchdog timer which would eventually turn off the beacon. "Eventually" was thought to be "21 days more or less."

The 21 days expired a month ago and the silence from UO-11 persists. Unofficial sources have speculated aloud that the watchdog timer may not have been implemented in the flurry of commands sent from Surrey after the beacon fell silent. Further confusion derives from not knowing which commands were actually loaded in UO-11 after the emergency developed and which were ignored because of transmission errors on the command uplink.

Adding to the difficulty surrounding the recovery efforts is a growing uncertainty regarding the actual orbit of UO-11. Surrey sources openly doubt the object called by NASA 14781 (84-21B) is REALLY UO-11. It would not be the first time errors of this type have occurred. Indeed OSCAR 8 was mistaken for sometime before Doppler measurements showed NASA had actually characterized AO-8 as launch debris and vice versa.

Arrangements have been made with SRI International in Menlo Park, California to attempt to localize UO-11 and later to command it. The SRI team under Dr. Robert Leonard, KD6DG, resuced UO-9 when a command glitch rendered it deaf for months in 1982 (see ASR 42, 43). Bob has agreed to arrange for a large L-band station to look for UO-11 on an "As-available" basis.

KD6DG is Director of the Radio Physics Laboratory at SRI International. He tells ASR that in accord with suggestions by UoSAT Program Manager Martin Sweeting, G3YJO, initial efforts will center on locating UO-11 from other hardware in the vicinity, the team will first track UO-9. Since UO-9 and UO-11 are physically quite similar, obtaining the radar cross-section of -9 will improve the discrimination ability when looking for -11. This radar location effort will be interspersed with attempts to hear the local oscillator (LO) of the 1.3 GHz command uplink aboard UO-11. Positive identification of the LO will confirm the bird is not "brain dead" as well as help localize it.

The third effort will be to command the bird to turn the 2 meter beacon off. Once this is done, Surrey can begin anew.

Amidst this recovery activity, however, is the growing reality that UO-11 is in a grave situation if it lives at all. Fears that the batteries may have frozen are sobering reminders of the cost of "minor" flaws occurring in space. In fact, there are few, if any, inconsequential failures in space.

After nearly two months in space, UoSAT OSCAR 11 hovers in the balance. Controllers on the ground know neither where it is with certainty nor the precise nature of the malady which may have cut short its mission at the outset. All the while an immutable clock beats out its indefatigable rhythm. Presently powerless, would-be UO-11 users and controllers alike wonder at its fate and contemplate the starkly unforgiving nature of the space business.

## **New DX Swells Active Countries On AO-10**

Recent reports indicate that more than 90 countries have been on AO-10 since launch. Reporting on claimed countries worked, G3IOR cites the claim of ON7HP (91), K5ADQ (90) and G3IOR (89). Moreover, more than a dozen new countries have appeared this year alone. G3IOR forwards the following:

VS6XLA (Jon) and VS6HH (Robin) both are on ssb. UM8MAW (Uri) on 145.910 ssb. Ron, YJ8RG, was on 145.930 ssb. HBØPOM/P, Fred, was on from Vaduz. FK8CR (Edi) was on, QSL via F6EWK. Graham, VK9ZW, has worked a number of stations.

Gordy, VE5XU, reports working JA1YPP/JD1 in late March from Ogasawara Island.

Ed, N2EK, reports T29ZSS (Rick) is on AO-10.

Nick, WØCA, adds GU6EFB to our growing countries list. The Guernsey Island station was on last autumn according to Nick.

Ted, W4FJ, adds LZ, VP5, FK1 and Y24QO to the tally.

Of course the REALLY BIG CATCH was BY1PK who appeared briefly on AO-10 in between stints on 15 meters. According to Chip Margelli, K7JA, who along with XYL Janet, operated the event, the visitors were given a choice of working 15 meters or OSCAR by the Chinese authorities. They opted for 15 meters except for a short interval which yielded a QSO or two on AO-10. KG6DX was one of the lucky ones to snare BY1PK via AO-10, ASR is told. Nice catch, Joe!

Additional DX inputs are welcome!

## **RS Contest Winners Announced**

The Radio Sport Federation has announced the winners in several categories of the contest held last October. The winners are:

Europe: 1. OK3AU; 2. SP9DH; 3. DJ8TJ

North America: 1. VE5XU; 2. WA5ZIB; 3. W3TSA

Soviet Union: 1. UA3CR; 2. UW6MA; 3. UA4NM

Club: 1. UK3QBW; 2. UK9SAD; 3. UK2CAU

(Sri, no info on Asia, Pacific or Africa.)

A short contest will be held on the RS birds from 1300 to 1530 UTC on 23 June. The usual rules apply. Thanks G3IOR.

## **New Area Coordinators**

AMSAT's Chief Area Coordinator Jim McKim, WØCY, announces the selection of three new area coordinators in North America. They are:

R. Dean Morrison, WØTT, 8407 W. Highridge Road, Parkville, MO 64152; Richard Ruhl, WD5GLD, P.O. Box 539, Kingfisher, OK 73750; Gerald W. Moore, WA8LAJ, 114 St. Francis Avenue, Tiffin, OH 44883 (419-447-6719).

ASR and AMSAT congratulates these new Area Coordinators. Thanks for joining up and hope that this Spring and Summer hamfest season keeps you busy!



## Short Bursts

- The Dayton Amateur Radio Association (DARA) has selected Lyle Johnson, WA7GXD, for its first technical Achievement Award. Lyle is President of TAPR, the Tucson Area Packet Radio group. He was cited for his leadership in bringing to fruition the now-famous TAPR Terminal Node Controller (TNC) board which is fast becoming de facto standard of amateur packet radio. Lyle attended the Trenton Computer Faire April 14 and 15 in New Jersey along with other TAPR packeteers. (See related story below.) DARA also selected Dave Bell, W6AQ, as Amateur of the Year. For special achievement, Ethel Smith, K4LMB, was selected in connection with her work with the YLRL. Dave Bell is among Holloywood's best known documentary producers and has been involved in the amateur radio documentaries for years.
- The Trenton Computer Faire brought thousands of computer enthusiasts together in the New Jersey capitol recently. Within these thousands were hundreds of radio amateurs. ARRL was a cosponsor of the affair. Paul Rinaldo, W4RI, ARRL Technical Department Manager, hosted a packet radio conference on the evening of 14 April. Recommendations from the meeting will be forwarded to the FCC. On Sunday several prominent packeteers presented papers to the amateurs attending. Representatives of packet groups from across North America were present.
- "SSTV Today" is the name of a monthly published in Michigan. Managing Editor Ron Flynn, KB8LU, is a strong AMSAT supporter as is Gale Sells, W7AMQ, who describes SSTV experiments over AO-10 in the April, 1984 edition. Subscriptions and back issues as well as information may be obtained from: SSTV Today, P.O. Box 39, Bangor, MI 49013. Thanks K8OCL!
- W9KDR at ARRL HQ advises that the W5LFL QSL (2-way) and all other QSL cards for one-ways have been mailed. Yours should be along soon if not already in your hands.

## Future Events Of Note

The West Coast VHF-UHF Conference will be held at the Paso Robles Inn, Paso Robles California May 4, 5 and 6. Contact Mike Goshay, K6HXW at P.O. Box 493, Arroyo Grande, CA 93420 for information. Register directly with the Paso Robles Inn. Call 805-238-2660. According to W6HDO, AMSAT Chairman W6SP, Project OSCAR President W6XN and Area Coordinator W6CG will be on hand in addition to the usual VHF/UHF notables including WB6NMT and K6MYC.

The Second Annual Conference on Private Sector Space Research and Exploration will be held on Sunday, May 27, at the Hayden Planetarium in New York City. The first session starts at 9:00 AM. AMSAT's Roger Soderman, KW2U, New York vicinity Area Coordinator will be on hand. Info is available from Ron Molz, I.S.P.C. Conference, 394 King Street, Chappaqua, NY 10514. You may call him at 914-238-5253 (home) or 516-531-2170 (work). The conference is sponsored by the Independent Space Research Group, ISRG. The ISRG proposes to build, launch and operate the Amateur Space Telescope (AST).

## UoSAT Story Acknowledged

ASR Editors gratefully acknowledge the help of Roger Peel, G8NEF, in preparing the story on "New UoSAT Systems Overview" which appeared in ASR 74, pages 3 and 4. Roger's byline should have appeared on the last line of the article as indeed it did on the manuscript. It was inadvertently omitted in the production process. We regret the omission and thank both Roger and University of Surrey for their continued documentary support. Likewise we extend our thanks to AMSAT UK for its superb communications vehicle, OSCAR News, Edited by Ron Broadbent, G3AAJ, Secretary AMSAT UK.

## UoSAT Overview *(Continued from the previous issue)*

### Magnetorquers & Boom Assembly

Magnetorquers — coils of wire energized to act as electromagnets — are built into all 6 faces of the spacecraft, wound around the edges of the honeycomb panels supporting the solar cells and the top and bottom plates. The fields created interact with the earth's magnetic field to produce a torque which tends to rotate the spacecraft.

When the spacecraft has been positioned so that the CCD camera end is pointing towards the earth (a long and complex process) a boom can be extended from the top of the craft. The boom appears similar to a steel tape measure, although it becomes nearly tubular once it has been unrolled. It is about 12 meters long. The boom carries a 2.5kg mass on the far end and this, in conjunction with the spacecraft body at the other end, creates a 'dumb-bell' configuration which naturally lines up with the earth's gravitational field so that one end points downwards, rather like a pendulum. It is, however, bi-stable! Any residual swinging motion can be damped with further controlled applications of the magnetorquers.

### Sun Sensors

The sun sensors are made with specially fabricated solar cell substrates which are masked by grey-code stripes and illuminated by light passing through a slit in a metal foil in front. The mask coding on the cells can be used to derive the angle at which the incident light is falling on the slit. Six such sensors are mounted around the top plate to provide complete 360 degree coverage.

### Horizon Sensors

Built by a first year student at the University of Surrey, the Horizon Sensor is able to detect when only one of two photodetectors is illuminated. The detectors are housed in two narrow tubes of 4mm diameter and mounted at a small angle to each other so that the whole sensor thus detects the 'edge' of an illuminated object. This will be the earth, the moon or the sun. A fix can then be made on the object's position.

### Digital Communication Experiment

The Digital Communications Experiment (DCE) was



designed and built by AMSAT and VITA groups in the USA and Canada. It has two serial ports which can receive and transmit to the RF system and the 1802, as well as an NSC-800 CPU and nearly 128kb of CMOS RAM. The DCE will be used to investigate various packet radio protocols for use with a future digital 'store-and-forward' satellite being planned by AMSAT. In addition, the DCE has interfaces with the navigation magnetometer and the telemetry system for long-term data storage.

### Space Dust Experiment

The Space Dust experiment was built by a group of students at the University of Kent, England. It has a dielectric diaphragm which, when punctured by a large particle, discharges the capacitance associated with it, thereby indicating the impact. In conjunction with a piezo crystal microphone which detects particles of smaller size, correlation techniques can yield a measurement of the momentum of the incident particle.

### CCD Camera

The CCD camera is a re-designed version of the device flown on UoSAT-1. Indeed, the CCD array at the center of the camera is the same type as used before, although the later batches of this part are substantially improved over the early one used 2 years ago. This time the analogue electronics surrounding the array are also greatly improved. The active area of 384 pixels by 256 pixels is stored with seven bits of grey-level, in 96kb of RAM in the DSR experiment. The DSR is then responsible for the picture downlink, adding addresses and error correction and detection information as required. The DSR downlink is organized in packets of 128 bytes each, three across each imager line, so that

two may be selected for display (using an extra digital filter) on existing UoSAT-1 CCD displays. The variable video amp gain and integration period of the CCD imager have been set up to provide the latitude required to photograph both land images and also auroral features, the latter being of interest in conjunction with the particle detector experiments.

### Particle Detectors and Wave Correlator Experiment

Three Geiger counters, each with different electron energy thresholds, similar to those flown on UoSAT-1, and a multi-channel electron spectrometer are mounted on the spacecraft to serve as a near-earth reference for magnetospheric studies to be carried out concurrently with the AMPTE & VIKING spacecraft missions due for launch later in 1984, and for ground-based studies of the ionospheric D, E and F regions being pursued with riometers and EISCAT. Data will be available in either real-time or, for more detailed analysis, from stored measurements over both polar auroral regions to professional scientists and radio amateurs. A data-base of the measurements acquired over the life of the spacecraft will be established at Surrey in conjunction with the SERC and will be available to approved experimenters.

The modulations imparted on particles, as a result of wave-particle interactions in the magnetosphere on auroral field lines, will be observed by a Particle Correlator Experiment designed around an NSC-800 microprocessor at the University of Sussex, England. The measurements will identify wave-modes responsible for accelerating electrons into the auroral beam and will also identify wave-modes which limit the further growth of the auroral beam.

Satellite: oscar-9  
Catalog number: 12888  
Epoch time: 84099.40458635  
Sun Apr 8 09:42:36.260 1984 UTC  
Element set: 613  
Inclination: 97.5844 deg  
RA of node: 72.9486 deg  
Eccentricity: 0.0003141  
Arg of perigee: 30.1444 deg  
Mean anomaly: 329.9951 deg  
Mean motion: 15.25230384 rev/day  
Decay rate:  $9.573e-05$  rev/day<sup>2</sup>  
Epoch rev: 13890  
Semi major axis: 6865.197 km  
Anom period: 94.411967 min  
Apogee: 494.507 km  
Perigee: 490.195 km  
Beacon: 145.8250 mhz

Satellite: oscar-10  
Catalog number: 14129  
Epoch time: 84097.34280771  
Fri Apr 6 08:13:38.586 1984 UTC  
Element set: 97  
Inclination: 25.7059 deg  
RA of node: 206.1228 deg  
Eccentricity: 0.6092647  
Arg of perigee: 260.5025 deg  
Mean anomaly: 30.1701 deg  
Mean motion: 2.05857411 rev/day  
Decay rate:  $-1.42e-06$  rev/day<sup>2</sup>  
Epoch rev: 613  
Semi major axis: 26105.470 km  
Anom period: 699.513315 min  
Apogee: 35636.380 km  
Perigee: 3826.098 km  
Beacon: 145.8100 mhz

Satellite: oscar-11  
Catalog number: 14781  
Epoch time: 84096.35772883  
Thu Apr 5 08:35:07.770 1984 UTC  
Element set: 19  
Inclination: 98.2505 deg  
RA of node: 158.7507 deg  
Eccentricity: 0.0013759  
Arg of perigee: 149.7713 deg  
Mean anomaly: 210.4279 deg  
Mean motion: 14.61838353 rev/day  
Decay rate:  $4.1e-06$  rev/day<sup>2</sup>  
Epoch rev: 506  
Semi major axis: 7062.462 km  
Anom period: 98.506103 min  
Apogee: 699.343 km  
Perigee: 679.909 km  
Beacon: 145.8250 mhz

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